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Publication date:
2009

Document version
Publisher's PDF, also known as Version of record

19th International Triticeae Mapping Initiative - 3rd COST Tritigen

Abstracts

Tritigen '09

COST FA0604

August 31st - September 4th 2009

Clermont-Ferrand, FRANCE

Abstract reference: ITMI2009_083

TILLING for low phytic acid (lpa) seed mutants in wheat

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Phytic acid (PA) is the main storage form of phosphorus in cereal seeds. Phytic acid is recognized as an anti-nutritional factor as neither humans nor swine and poultry are able to digest and utilize PA. Since PA is a strong chelator of important minerals such as Fe, Zn, Mn and Ca, this may contribute to lack of micronutrients in human populations where cereals are the primary source of nutrition. Furthermore, in husbandry excretion of PA can lead to accumulation of P in soil and water, and subsequently to eutrophication. One way to deal with the problems outlined above would be to identify low phytic acid (lpa) mutants impaired in PA biosynthesis or transport. Since a number of genes affecting these processes have been identified in cereals, particularly in rice, barley and maize, one strategy to identify a large number of lpa mutants would be to use TILLING (Targeting Induced Local Lesions IN Genomes).

In our group we have developed six TILLING populations of spring wheat, including one (Amaretto) where two rounds of EMS treatment have been conducted to increase mutation frequency. This population (M_2) is currently screened for mutations using primer pairs specific for each of the three homologue wheat genes encoding *myo*-inositol 3-phosphate synthase (MIPS), which catalyzes the first committed step in the biosynthesis of PA. The mutation frequency in the Amaretto population is rather high as an average of 2-4 mutations are detected each time 100 plants are tested with one of the MIPS specific primer pairs. Further screenings will be conducted to confirm this mutation frequency. Mutations causing amino acid changes have been identified in the three wheat MIPS homologues and these are currently tested for high content of free phosphate in the grains to identify mutations with an effect on the phenotype. In addition, the three wheat MIPS genes have been physically mapped to wheat chromosomes using a set of wheat deletion lines.